C. REMARKS / ARGUMENTS

1. Rejection of Claims 18-24 Under 35 U.S.C. § 101

Claims 18-24 stand rejected as being directed to non-statutory subject matter.

In response, Applicant has cancelled claims 18-24, and new claims 25-28 directed to a computer-readable medium have been added, thereby overcoming the above 35 U.S.C. § 101 rejection.

2. Rejection of Claims 1, 2, 4, 6, 14, 15 and 17-24 Under 35 U.S.C. 102(b)

Claims 1, 2, 4, 6, 14, 15 and 17-24 stand rejected under 35 U.S.C. 102 (b) as anticipated by US Pat. No. 5,420,508 to Smith et al. ("Smith"). Applicant respectfully traverses.

Claims 18-24 have been canceled. Claims 1, 2, 4, 6, 14, 15, and 17 will be addressed in this section.

Amendments to Independent Claims 1, 14, 15, and 17

Independent claims 1, 14, 15, and 17 have been amended, as set forth in section B above, in order to more clearly describe the subject matter being claimed.

Claims 1, 14, and 15 have been amended to recite a system configured to identify a gap between a smallest noisefree singular value and a first noise singular value, in a graph of the singular values of a correlation matrix (that is constructed within a vector space created from the averaged signal, as recited in the original unamended claims). These claims have been further amended to clarify that further measurements (of the sample response to excitation energy) are prevented, if such a gap has appeared in the singular value graph. Finally, claims 1, 14, 15, and 17 have been amended to clarify that the measurements of response signals or data are measurements from a sample.

Amended claim 1 now recites *i.a. "An apparatus for performing spectral analysis <u>of a sample</u> ... comprising ..a data acquisition system configured to ... average the measured signal over a plurality of measurements <u>from the sample</u> to generate an averaged signal <u>for the sample</u>; ... and a control system configured to identify, in a graph of the singular values of the correlation matrix constructed within the vector space created from the averaged signal, a gap between a smallest noisefree singular value and a first noise singular value, so as to request the data acquisition system to perform additional measurements <u>of the signal emitted from the sample</u>...."*

Amended claim 14 now recites *i.a. "A control system for controlling the acquisition and processing of data <u>from a sample</u> by an NMR apparatus ... said NMR apparatus comprising ...a first processing system for identifying, <u>in a graph of the singular values of the harmonic inversion correlation matrix</u>, a gap between a noisefree singular value ... and an adjacent noise singular value ... so that said control system can request further measurements <u>of NMR data from the sample</u> by said data acquisition system if said gap cannot be identified."*

Amended claim 15 now recites *i.a. "A control system for controlling the acquisition and processing of data <u>from a sample</u> by a spectral analysis apparatus ...said control system comprising ... a computer-usable medium having stored therein computer-usable instructions ... said instructions when executed by said processor cause said processor to ... 1) identify, <u>in a graph of the singular values of the harmonic inversion correlation matrix</u>, a gap between a noisefree singular value ... and an adjacent noise singular value ...; 2) request further measurements <u>of the response signals from the sample</u> ... if said gap cannot be identified ...."*

Amended claim 17 now recites *i.a. "...input and store a signal <u>emitted by a sample in response to excitation energy applied thereto and acquired</u> by a data acquisition system configured to measure said signal <u>from the sample</u> and average said signal over a plurality of measurements <u>from the sample</u> ...."* (In its

unamended form, claim 17 further recites i.a. *"computer-usable instructions ... when executed ... cause said processor to ... determine whether a gap appears between a noisefree singular value and an adjacent noise singular value in a plot of said singular values...."*)

No new matter is added by the above amendments.[1]

Amended independent claims 1, 14, 15, and 17 are clearly distinguishable from Smith, which is directed to an entirely different subject matter, namely the fitting of a free induction decay (FID) curve to data.[2] Specifically, Smith discloses the use of mathematical iterative techniques (such as M-L (Marquardt-Levenberg) analysis, including the application of PCA (principal components analysis) to the M-L analysis) in order to fit an FID curve to data. In particular, Smith discloses a method in which *"[t]he entire [FID] curve is decomposed into component curves and these curves are fitted to the data by an iterative process based upon the Marquardt-Levenberg (M-L) approximation technique...."* Smith Col. 5:67 – 6:2. Smith goes on to explain that *"[t]his technique is used to determine the magnitude of all the parameters ... which best fit the FID curve. M-L is an iterative technique where the entire curve is determined at once."* Smith Col. 6:2-6:7

Nowhere does Smith disclose or mention how to determine when to stop taking measurements of the response of a sample to excitation energy, as required by the above claims. Furthermore, in contrast to the present application, in which

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[1] Support for these amendments can be found throughout the specification, including but not limited to the following paragraphs: [0008]("... *The singular values ... are* ***plotted in a graph****....*"); [0010]("...*the criterion for stopping the acquisition of transients is the appearance of a stable gap* ***in the singular value graph*** ...."); [0018]("... *The apparatus 100 generates the characteristic spectra of one or more constituents* ***of the sample****, by applying an excitation energy to* ***the sample, measuring the signals emitted by the sample*** *in response to the applied excitation energy....*"); [0033-0034]("... *the matrix diagonalizer diagonalizes the correlation matrix ... thereby obtaining the* ***singular values*** u_i ....". *... **a graph of** $\ln(u_i)$ **against the index** i **is produced**...*"); [0035]("*The user ... determines whether a separation or a "gap" between the first ... noise singular value* ***in the plot****, and the smallest ... noisefree singular value...* ***in the plot****, can be identified.*"); [0036]("...*the interactivity is with* ***the singular value graph*** *.... the criterion for stopping the acquisition of transients is the appearance of a stable gap* ***in the singular value graph*** ...."); [0037]("...*the control system 150 can be configured to determine ...whether a clearly discernable gap has appeared between the smallest signal point and the first noise point* ***in the plot of singular values*** ....")(boldface added).

[2] <u>See e.g.</u> Smith Col. 5:67-6:5 ("*[t]he entire [FID] curve is decomposed into component curves and these curves are fitted to the data by an iterative process based upon the Marquardt-Levenberg (M-L) approximation technique.... This technique is used to determine the magnitude of all the parameters ... which best fit the FID curve ....*"

a single experiment is perform on a sample, Smith carries out a series of independent NMR experiments, including experiments on multiple samples (see e.g. Smith Col. 6:63-66 ("*As discussed herein, the techniques ... include calibration by applying the M-L technique to reach solutions for a group of FIDs* ***from samples*** *with known properties.*")

What Smith addresses is how to fit an FID curve to data, i.e. how to "*determine the magnitude of all the parameters....which best fit*" the FID curve. Smith discloses mathematical methods for decomposing an FID curve into its component curves, then fitting these component curves to data. Unlike Applicant's invention, Smith does not disclose or relate to methods for determining when to stop taking measurements of response signals of a sample to external excitation (such as NMR).

In fact, Smith **teaches away** from Applicant's claimed limitations directed to measurements of response signals from a sample, by explicitly teaching the introducing of new samples during the iterative curve filling process. See e.g. Smith Col. 7: 20-28 ("*...If the sample region is not clear ..., measurement is interrupted .... Then* ***another sample*** *is admitted .... Jets J adjust and stabilize* ***the new sample.***")

The mathematical methodology disclosed in Smith is also very different: unlike in the present invention, there is no teaching or suggestion in Smith of identifying a gap in a graph of singular values of a correlation matrix that is constructed within a vector space created from an averaged signal, i.e. a signal that results from averaging over many measurements. Most importantly, there is no teaching or suggestion in Smith of using the appearance and stability of that gap as a criterion for stopping further measurements of response signals (emitted by a sample in response to excitation energy applied to the sample). Smith also does not teach or suggest the following claim elements in the present application: 1) creating a vector space from an averaged signal (averaged of a plurality of measurements of the response of a sample to excitation energy); 2) constructing a

correlation matrix within such a vector space; and 3) generating a graph of singular values of the correlation matrix.

Specifically, Applicant submits that at least the following limitations of amended claims 1, 14, and 15, and unamended claim 17, cannot be found in Smith.

a) *"a noise-reduction pre-processor configured to create a vector space from said averaged signal, and to generate one or more singular values and corresponding eigenvectors of a correlation matrix constructed within said vector space, said vector space containing a noisefree signal subspace and a noise subspace ...."* (Claim 1)

b) *"a control system configured to identify, <u>in a graph of the singular values of the correlation matrix constructed within the vector space created from the averaged signal</u>, a gap between a smallest noisefree singular value and a first noise singular value"* (Claim 1)

c) *"so as to request the data acquisition system to perform additional measurements <u>to be averaged over</u> if no such separation <u>gap</u> can be identified, and to prevent further measurements from being made by the data acquisition system if the <u>gap has appeared and is stable</u>"* (Claim 1)

d) *"a first processing system for identifying, <u>in a graph of the singular values of the harmonic inversion correlation matrix</u>, a gap between a noisefree singular value ... and an adjacent noise singular value"* (Claim 14)

e) *"...so that said control system can request further measurements by said data acquisition system if said gap cannot be identified."* (Claim 14)

f) *"identify, <u>in a graph of the singular values of the harmonic inversion correlation matrix,</u> a gap between a noisefree singular value ... and an adjacent noise singular value"* (Claim 15)

g) *"request further measurements by said data acquisition system if said gap cannot be identified"* (Claim 15)

h) *"determine whether a gap appears between a noisefree singular value and an adjacent noise singular value in a plot of said singular values"* (Claim 17)

i) *"request further measurements by said data acquisition system, if said gap cannot be identified"* (Claim 17)

(In the above list, new limitations added by the present amendment and response have been underlined.)

Limitation a)

Regarding limitation a), nowhere in Smith is there any teaching or suggestion of any noise-reduction pre-processor that is configured to create a vector space from an averaged signal (i.e. a signal resulting from averaging over a plurality of measurements[3]), much less any such vector space that includes a noisefree signal subspace and a noise subspace, as required by limitation a).

On page 4 of the Office Action, the Examiner refers to Col.7:66- Col. 8:9 as disclosing this limitation. Nowhere in Col. 7:66-8:9 of Smith, however, is there any teaching or suggestion of creating a vector space from a signal that results from averaging over a plurality of measurements of the response of a sample to external excitation. Col 7:66-8:9 of Smith is reproduced below:

> The resulting data utilized in the computer 106 (FIG. 1) is the equation for the FID curve as composed of a number of component curves. Each of these curves (and their intercepts) has been experimentally and theoretically related to particular nuclei of interest. In particular, when the FID curve equation is determined, the ratios of the y-axis intercepts, the cross product and squares of these ratios and the decay times (T2's) for each of the curve components, the product temperature and a cosine term (resonance) form a multidimensional model. These parameters are called explanatory, or `x`, variables in the following discussion.

As seen above, Col 7:66-8:9 of Smith discusses a subject entirely different from the present application, namely how an FID curve is made up of a number of component curves (each of which relate to particular nuclei), and how to fit these component curves to data. As also seen above, Col 7:66-8:9 of Smith also introduces certain parameters of these component curves, including *i.a.* ratios of y-axis intercepts, decay times T2, and product temperature. These parameters of the component curves are called "x" variables or "explanatory" variables in Smith, and

[3] <u>See e.g.</u> claim 1, which recites *i.a.* "a data acquisition system configured to ... average the measured signal over a plurality of measurements to generate an averaged signal."

can form a multidimensional model, as clearly set forth in the portion of Smith quoted above.

The subject matter discussed in 7:66-8:9 of Smith, or elsewhere in Smith, has no relation or bearing to any averaging of signals (that measure the response of a sample to excitation energy) over a plurality of measurements, nor to the creation of any vector space from such an averaged signal, nor to any vector space that includes a noisefree signal subspace and a noise subspace.

For these reasons, Smith fails to teach limitation a).

Limitations b), d), f), and h)

Regarding limitations b), d), f), and h), nowhere does Smith teach or suggest identifying, in a graph of the singular values of a correlation matrix constructed within a vector space created from an averaged signal, a gap between a smallest noisefree singular value and a first noise singular value.

As a preliminary matter, Smith does not teach or suggest creating a vector space from an averaged signal, or constructing a correlation matrix within such a vector space, or generating singular values of such a correlation matrix, as previously explained.

It follows that Smith also does not teach or suggest identifying any gap in a graph of such singular values, and in particular does not teach or suggest identifying a gap between a smallest noisefree singular value and a first noise singular value, in a graph of singular values.

On page 4 of the Office Action, the Examiner refers to Col. 9:45-10:20, Col. 10:28-63; Col. 4:34-45; and Fig. 3, steps 60, 66, 68, 70, and 72, as disclosing the limitation relating to identifying a gap between a smallest noisefree singular value and a first noise singular value. Applicant respectfully traverses, and submits that these cited portions of Smith do not teach or suggest identifying a gap between a

smallest noisefree singular value and a first noise singular value, in a graph of singular values of a correlation matrix constructed within a vector space created from an averaged signal.

What the portions of Smith cited by the Examiner[4] discuss are eigenvalues[5] that result from transforming the so-called "x" data into "z" data. See e.g. Smith Col. 9:34-37 (*"This process 48 of transforming the 'x' data into 'z' data produces a diagonal matrix C of Eigenvalues of the principal components."*)

As explained in Smith and noted above, the "x" data (also referred to in Smith as "explanatory variables") bear no relation to a signal resulting from averaging over a plurality of measurements, or to any vector space from such an averaged signal. Rather, the "x" data (or "explanatory variables") are just parameters, and in particular are parameters that are determined from an FID curve. See e.g. Smith Col. 8:3-9 ("*...when the FID curve equation is determined, the ratios of the y-axis intercepts, the cross product and squares of these ratios and the decay times (T2's) for each of the curve components, the product temperature and a cosine term (resonance) form a multidimensional model.* ***These parameters are called explanatory, or 'x', variables."***)(boldface added.) Likewise, the "z" data are another set of explanatory variables (i.e. parameters of the FID curve equation) that have a specific definite mathematical relation (given by Eq. 6 of Smith) to the "x" data. See e.g. Col 9:29-34 of Smith.

The eigenvalues discussed in Smith therefore do not result from any correlation matrix that is constructed from any vector space created from an averaged signal, as required in Applicant's claims.[6]

While eigenvalues (as well as singular values, which are simply real, nonnegative eigenvalues) and matrix diagonalization are mathematical tools that

[4] Smith Col. 9:45-10:20, Col. 10:28-63; Col. 4:34-45; and Fig. 3, steps 60, 66, 68, 70, and 72

[5] Singular values are simply real, non-negative eigenvalues, as explained e.g. in paragraph [0027] of the present application.

[6] In particular, from any harmonic inversion correlation matrix as recited in limitations d) and f).

are widespread in a broad range of applications, and happen to be one of the fundamental mathematical tools in quantum mechanics, the eigenvalues discussed in Smith bear no relation to the singular values disclosed and claimed by Applicant in the present application. The singular values in Applicant's invention result from diagonalizing a correlation matrix, which is constructed within a vector space, which in turn is created out of a signal that has been averaged over a plurality of measurements. The eigenvalues discussed in Smith, on the other hand, result from transforming one set of parameters[7] of a <u>single</u> FID curve to another.

In sum, Smith does not teach or suggest identifying a gap (between a noisefree singular value and a noise singular value), in a graph of singular values of a correlation matrix, as required by above-identified limitations b), d), f), and h). As explained earlier, Smith does not teach or suggest any correlation matrix constructed within a vector space that is created out of an averaged signal, and that includes a noisefree signal subspace and a noise subspace. Such topics are simply foreign to Smith. Nor does Smith teach or suggest generating singular values by diagonalizing such a correlation matrix.

For these reasons, Smith does not teach or suggest above-listed limitations b), d), f), and h).

<u>Limitations c), e), g), and i)</u>

Regarding limitations c), e), g), and i), nowhere does Smith teach or suggest requesting further measurements if no such gap can be identified. Nowhere in Col. 9:45-10:20, Col. 10:28-63; Col. 4:34-45; and Fig. 3, steps 60, 66, 68, 70, and 72, cited by the Examiner, is there any teaching or suggestions that further measurements be made if no such gap can be identified in a singular value graph. This is a natural result of Smith failing to teach or suggest identifying such a gap in such a singular value graph, as explained above.

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[7] These parameters include but are not limited to the ratios of the y-axis intercepts, the decay times (T2's), the product temperature and a cosine term.

For these reasons, Smith does not teach or suggest above-listed limitations c), e), g), and i).

Responses to Examiner's Statements on Pages 4 and 5 of the Office Action

The Examiner states on page 4 that "*Smith teaches that the smallest singular values correspond to noise and cause the statistical fitting procedure (M-L fit) to produce an erroneous result.*" This statement is irrelevant to Applicant's claims, because none of Applicant's claims recite (nor does Applicant's specification disclose) that the smallest singular values correspond to noise. On the contrary, the gap recited in Applicant's claim involve the smallest noisefree singular value, not to any smallest singular values that correspond to noise. Further, none of Applicant's claims recite (nor does Applicant's specification disclose) that such smallest singular values cause any statistical fitting procedure (M-L or any other procedure) to produce an erroneous result. Statistical fitting procedures[8] are unrelated to the present application, which is directed to a different subject matter, namely methods and systems for determining when a sufficient number of measurements (of the response of a sample to excitation energy) have been made.

The Examiner further states on p. 4 that the control system reduces the amount of noise singular values in the Z1 subset, referring to Col. 10:35-54 or steps (4) – (11), and states that this has the same effect as identifying the gap between the smallest noisefree singular value and the noise singular value. Applicant respectfully traverses.

Smith Col. 10:35-54 is reproduced below:

(4) step-wise reduce the number of x's by: running the entire process for predicting "value" taking the x's one at a time and retaining those x's which improve upon the accuracy of the "value", call this subset x(1);

(5) perform a principal component analysis of the x(1) set which yields a set of independent (orthogonal) variables called z's together with their Eigenvalues;

(6) step-wise (as in (4) above) reduce the z's to a set z(1);

[8] In particular, M-L iterative techniques for fitting FID curves to data.

(7) form a regression model equation from z(1);

(8) measure FID from unknown sample;

(9) perform M-L analysis on the sample FID and form the required Z's (the Z1 subset and any z's used for the M-L test);

(10) take the z with the smallest Eigenvalue and test that the sample z is within a limit of 5 (or 3) standard deviations from the calibration z, (after normalization);

(11) if the sample is outside the limit of (10), re-analyze FID via M-L;

As seen above, nowhere does Smith teach or suggest (in Col. 10:35-54 or elsewhere) reducing the amount of noise singular values in the Z1 subset. What Smith Col. 10:35-54 does teach, as shown above, is to "*step-wise reduce the number of x's*", where x's are a set of parameters (including e.g. ratios of y-axis intercepts, decay times, and product temperature). Smith does not teach anywhere reducing the amount of singular values (either noise or noisefree) of any correlation matrix that is generated within a vector space that is created from an averaged signal, which is what Applicant's claims require. In particular, Smith does not teach or suggest reducing any amount of noise singular values in a Z1 subset, in Col 10:35-54 or elsewhere. Noise singular values as recited in Applicant's claims is a topic foreign to Smith.

Further, reducing the amount of noise singular values cannot have the same effect as identifying a gap between the smallest noisefree singular value and the noise singular value, because such a gap indicates how far apart the smallest noisefree singular value is from the noise singular value, not what the amount of noise singular values is.

The Examiner further states on pp. 4-5 that the control system performs additional measurements when the gap is not defined, and prevents further measurements when the gap is stable. Applicant respectfully traverses, for reasons explained above.

The Examiner further states on p. 5 that *"the M-L fit ... provides plausible results as a result of accepting the eigenvectors that fall within ...standard deviations from the mean,"* and that it is *"inherent that eigenvectors, and ... singular values, are very large or very small when they fall outside ... standard deviations from an expected ... value."* These statements are irrelevant to Applicant's claims, none of which recite any M-L fit, or any accepting of eigenvectors that fall within standard deviations from the mean, or any very large or very small singular values, or any singular values that fall outside standard deviations from a mean value.

The Examiner further states that *"noise is associated with data that shows multicollinearity,"* referring to Col 9:47-50. Applicant respectfully traverses. Col. 9:47-50 do not refer to multicollinearity of the data to which the FID curve is fitted using M-L techniques, but rather refers to multicollinearity of the explanatory variables, i.e. the parameters of the FID curves. Also, noise in spectral measurements is unrelated to multicollinearity in data.

Claims 1, 2, 4, 6, 14, 15 and 17 Are Not Anticipated By Smith

Claims 1, 14, 15, and 17

A document anticipates a claim only if the document discloses all the elements and limitations of the claim. If even one element or limitation of the claim is missing, a § 102 rejection fails. See e.g. Kalman v. Kimberly-Clark, 713 F.2d 760, 771, 218 U.S.P.Q. 781 (Fed. Cir. 1983).

Accordingly, Smith does not anticipate the invention as recited in amended independent claims 1, 14, 15, and unamended claim 17, because Smith fails to teach or suggest at least the limitations a) – i) discussed above, for all of the reasons set forth above.

For these reasons, Applicant submits that claims 1, 14, 15, and 17 are not anticipated by Smith, and are allowable.

Claims 2, 4, and 6

Claims 2, 4, and 6 depend on claim 1, and therefore include all the limitations of claim 1. Accordingly, it follows that claims 2, 4, and 6 are also not anticipated by Smith.

3. Rejection of Claims 3 and 16 Under 35 U.S.C. 103(a)

Claims 3 and 16 stand rejected under 35 USC 103(a) as being unpatentable over Smith as applied to claim 1, and further in view of U.S. pat. No. 5,148,379 to Konno ("Konno"). Applicant respectfully traverses.

Applicant submits that the cited documents, either alone or in combination, fail to teach or suggest all of the elements and limitations recited in claims 3 and 16.

Claim 3

Claim 3 depends on claim 1.

For the reasons discussed earlier, Smith does not teach or suggest at least above-identified limitations a), b), and c) of claim 1. Konno (directed to automatically generated simulation programs) fails to cure the above deficiency of Smith, and the Examiner does not contend otherwise. Therefore, claim 1 is not obvious over Smith and Konno under 35 U.S.C. § 103.

"If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious." MPEP 2143.03; In re Fine, 837 F.2d 1071, 2 USPQ2s 1596 (Fed. Cir. 1988).

Therefore, claim 3 (which depends on claim 1) is also not obvious over Smith and Konno, under 35 U.S.C. § 103.

Claim 16

Independent claim 16 has been amended to recite *a control system configured to identify a separation between a noisefree singular value and an adjacent noise singular value, in a graph of the singular values.*

For reasons explained in detail above, Smith fails to teach or suggest at least the following limitations of claim 16:

- *1) a matrix generator for forming a vector space from said averaged signal and constructing a correlation matrix within said vector space, said vector space containing a noisefree signal subspace and a noise subspace;*
- *2) a matrix diagonalizer for diagonalizing said correlation matrix to obtain its singular values and the corresponding eigenvectors, said singular values including noisefree singular values associated with said noisefree signal subspace, and noise singular values associated with said noise subspace*; and
- *a control system configured to identify a separation between a noisefree singular value and an adjacent noise singular value, in a graph of the singular values, so as to allow the data acquisition system to perform additional measurements if no such separation can be identified.*

Konno fails to cure this deficiency of Smith, and the Examiner does not contend otherwise.

In order to establish a *prima facie* case of obviousness, at least the following condition must be satisfied: The prior art reference(s) must teach or suggest all of the elements and limitations recited in the claims.

Smith and Konno, either alone or in combination, fail to teach or suggest all the limitations of claim 16.

Therefore, claim 16 is not obvious over Smith and Konno, under 35 U.S.C. § 103, because no *prima facie* case of obviousness can be established.

5. Rejection of Claims 5, 7, and 8 Under 35 U.S.C. § 103(a)

Claims 5, 7, and 8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith as applied to claim 4, and further in view of U.S. Pat. No. 3,752,081 to Freeman ("Freeman"). Applicant respectfully traverses.

Claims 5, 7, and 8 depend on claim 1. For the reasons discussed earlier, Smith does not teach or suggest at least above-identified limitations a), b), and c) of claim 1.

Freeman (directed to the acquiring of spin-spin coupling constants using a plurality of gyromagnetic resonators) fails to cure this deficiency of Smith, and the Examiner does not contend otherwise. Therefore, claim 1 is not obvious over Smith and Freeman, under 35 U.S.C. § 103.

"If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious." MPEP 2143.03; In re Fine, 837 F.2d 1071, 2 USPQ2s 1596 (Fed. Cir. 1988).

Therefore, claims 5, 7, and 8 (which depend on claim 1) are also not obvious over Smith and Freeman under 35 U.S.C. § 103.

6. Rejection of Claims 9-13 Under 35 U.S.C. § 103(a)

Claims 9-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith, as applied to claim 1, and further in view of U.S. Pat. No. 5,485086 to Meyer. Applicant respectfully traverses these rejections.

Claims 9-13 depend on claim 1. For the reasons discussed earlier, Smith does not teach or suggest at least above-identified limitations a), b), and c) of claim 1.

Meyer (directed to spiral k-space scanning) fails to cure this deficiency of Smith, and the Examiner does not contend otherwise. Therefore, claim 1 is not obvious over Smith and Meyer, under 35 U.S.C. § 103.

"If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious." MPEP 2143.03; In re Fine, 837 F.2d 1071, 2 USPQ2s 1596 (Fed. Cir. 1988).

Therefore, claims 9-13 (which depend on claim 1) are also not obvious over Smith and Meyer under 35 U.S.C. § 103.

7. Conclusion

On the basis of the foregoing amendments, Applicant respectfully submits that all of the pending claims are in condition for allowance. An early and favorable action is therefore earnestly solicited.

Respectfully submitted,

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